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The Associativity Formula and the Projection Formula

In the 1950s, Samuel developed the Intersection Theory of Cycles in Algebraic Geometry by reducing to algebraic counterparts about the Samuel multiplicity, the normalized leading coefficient of the Hilbert-Samuel polynomial. Reversing history, we'll give new proofs of the Associativity Formula and the Projection Formula for the Samuel multiplicity by reducing to geometric counterparts, which have been proved directly primarily by Fulton. Furthermore, we'll see that, happily, similar proofs yield useful generalizations of the two formulas to the Buchsbaum-Rim multiplicity.